

**ALASKA
AIRBORNE GEOPHYSICAL/GEOLOGICAL
MINERAL INVENTORY**

FY98 Program



STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
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BACKGROUND

The Airborne-Geophysical/Geological Mineral Inventory project is a special multi-year investment to expand the knowledge base of Alaska's mineral resources and catalyze private-sector mineral development. The project seeks to delineate mineral zones on Alaska state lands that: 1) have major economic value; 2) can be developed in the short term to provide high quality jobs for Alaska; and 3) will provide economic diversification to help offset the loss of Prudhoe Bay oil revenue. Started in 1992, the project was originally designed to systematically acquire geophysical, and where necessary, geological data for about 40 million acres of state-owned uplands having high perceived mineral potential. Funding restrictions have led to decreasing the annual scope of the project, but the purpose and goals have not changed.

Public release of the geophysical and geological data collected from these surveys has had a rapid and profoundly positive effect on private-sector exploration investments in the Nome, Circle, and Fairbanks areas. Millions of dollars of venture capital have been spent in the local economies of these districts in direct response to the new geologic knowledge provided by the surveys. This rate of investment will continue for years. We anticipate exploration activities in the Rampart, Manley, Tofty, Upper Chulitna, and Petersville districts also will accelerate as the recently completed geophysical surveys and the geological data needed to interpret them become available.

Although mineral development is a high risk enterprise, there is a good probability that several of the prospects identified with the help of data generated by this project will become major mines and thus return the amount of the state's data generation investment a hundred fold. Clearly, the Airborne Geophysical/ Geological Mineral Inventory project has been successful in catalyzing private-sector investment and job generation at a level that far surpasses the cost of conducting the surveys. A similar investment in geologic knowledge in 1982 contributed to the ultimate development of the Fort Knox gold mine that is currently adding several hundred million dollars of capital to the state's economic base and is projected to contribute about \$76 million per year to Alaska's economy for at least the next 12 years.

This project was initiated in FY93 with a legislative CIP appropriation of \$450,000. That amount was in-



Collecting geophysical information using airborne instrumentation.

sufficient to acquire the quality and amount of airborne geophysical and geological data needed for the start of an effective cost efficient program. Thus additional funding was requested of the Legislature in FY94. By June of 1993, the Legislature had appropriated an additional \$750,000, which was pooled with the previous year's appropriation to launch the project. The first mineral districts surveyed were Nome-west, Nyaq, Circle-core, and Valdez Creek. Geophysical maps and computer-compatible data files for these districts were available to the public by February 1994. In FY95, airborne geophysical surveys were completed for the core areas of the Fairbanks and Richardson mining districts. In FY96, major portions of the Rampart-Manley-Tofty mining districts were flown. The FY97 legislative CIP appropriation funded an airborne survey of the remaining high mineral potential area of the Rampart district and also geophysical surveys of the Upper Chulitna and Petersville-Collinsville mining districts. To date

2,335,000 acres have been geophysically surveyed (Table 1) and \$2,600,000 of CIP funds have been appropriated to fund the project.

Candidate lands for this project have been identified on the basis of existing geologic knowledge, land ownership, and responses to annual solicitations for nomi-

nations from Alaska's mineral industry and Native regional corporations. Currently 51 mineral districts have been identified as candidates for the airborne-geophysical/geological mineral inventory surveys (Figure 1). As of September 1996, field work has been completed for the nine geophysical and geological surveys noted below in Table 1.

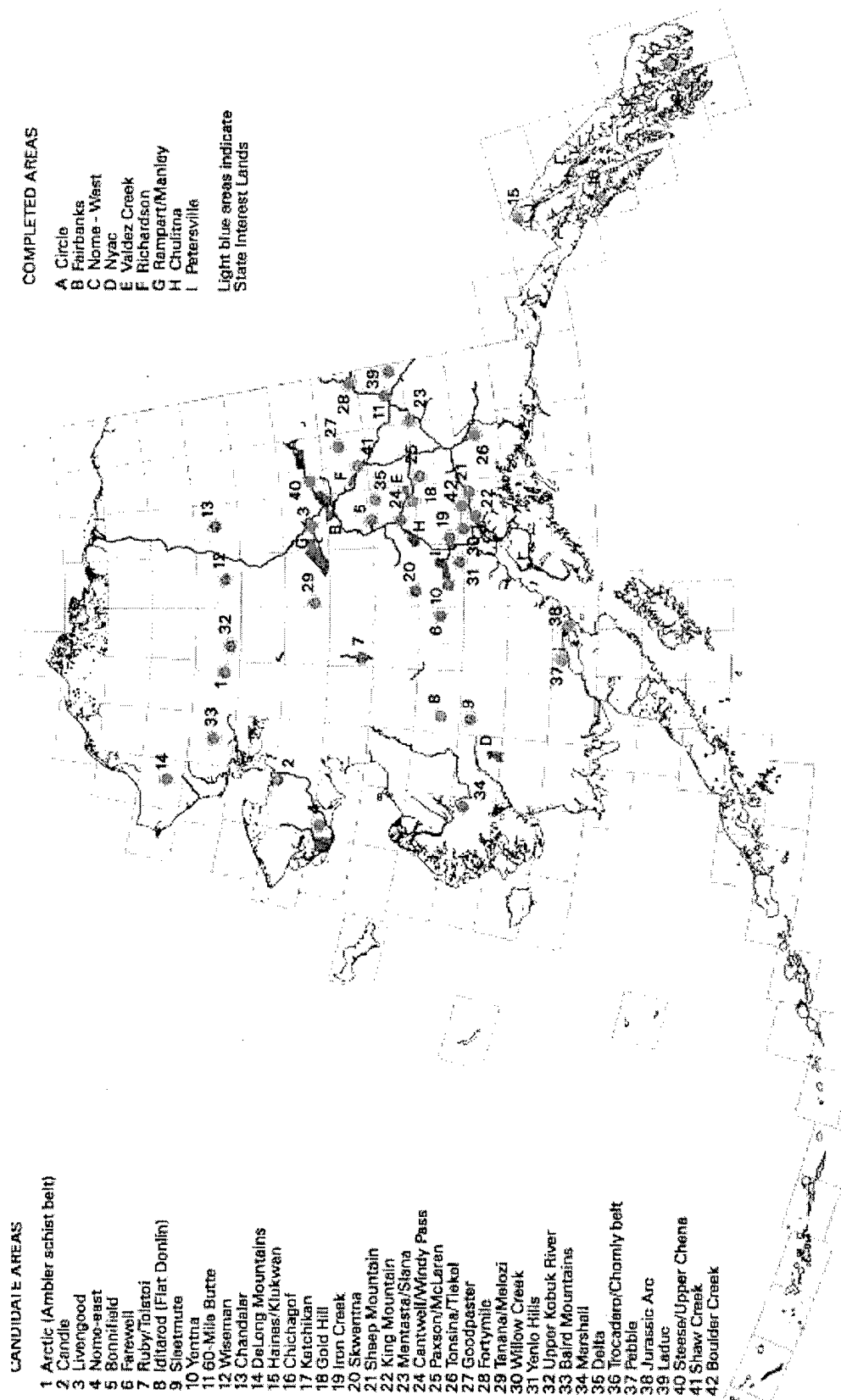
Table 1. Geophysical survey areas for which data gathering and field work is complete.

Nome District western core area	494 sq. miles	Airborne geophysical/ground-truth geological mapping
Nyac District core area	183 sq. miles	Airborne aeromagnetic mapping only
Circle District core area	338 sq. miles	Airborne geophysical mapping/ground-truth geological mapping
Valdez Creek District	75 sq. miles	Airborne geophysical mapping
Fairbanks District	626 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Richardson District	137 sq. miles	Airborne geophysical mapping/ground-truth geologic map (pending)
Rampart/Manley-Tofty	1017 sq. miles	Airborne geophysical mapping/ground-truth geologic map (in progress)
Upper Chulitna District	364 sq. miles	Airborne geophysical mapping/ground-truth geologic map (pending FY98 and FY99)
Petersville-Collinsville District	415 sq. miles	Airborne geophysical mapping/ground-truth geologic map (pending FY99)

Three surveys (western Nome District, Nyac, and parts of the Rampart/Manley District) were conducted in cooperation with the Bering Straits Native Corporation, Sitnasuak Village Corporation, Calista Native Corporation and Doyon Native Corporation, respectively. As owners of large tracts of land intermingled with state lands, they contributed various combinations of services, private geoscience data files, and funding to support the surveys.

Numerous major mining companies have been active in the Nome, Circle, and Fairbanks areas following release of the geophysical surveys. Several million dollars were spent in exploration, and approximately 150 new claims were located on State lands in the Nome area following the geophysical and geological surveys of the western half of the Nome district. The renewed corporate

interest in the Nome area continues to this day and additional geophysical and geological surveys of the eastern half of the district would further increase the probability of establishing a major mine. Likewise, the Circle district has received new attention from major mining companies. Immediately following the release of the Fairbanks district airborne geophysical maps, over 100 square miles of mineral claims were staked and subsequent exploration activity has been intense. Progress has been made in locating a second major lode gold deposit, and continued exploration involving a growing number of major mining companies proceeds unabated. Many of the immediate exploration expenditures are made locally, and if mineral production results, scores of additional high quality jobs will be created for local residents.



ALASKA AIRBORNE GEOPHYSICAL/GEOLOGICAL MINERAL INVENTORY

The Geophysical/Geological Mineral Inventory CIP project is designed to coordinate the generation of airborne geophysical data with ground-based geologic surveys. The geophysical data are of limited effectiveness

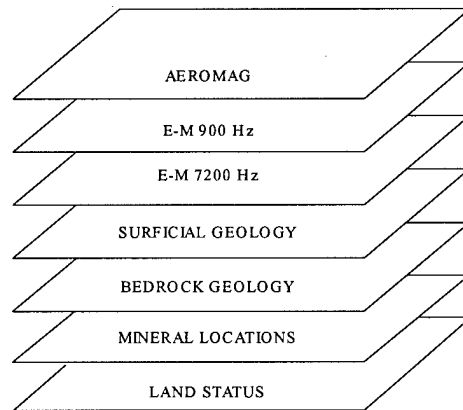


unless good geologic maps are available to permit analysis and interpretation of the geophysics. If existing geologic data are inadequate, the required geological surveys are most effective when they follow generation of the final geophysical maps. Thus, unless good quality 1:63,360-scale geologic maps already exist, at least one additional year of ground-based field studies is needed to complete a project after an area has been surveyed with airborne geophysical sensors.



Post-geophysical survey ground-truth mapping is now being conducted in the Rampart-Manley-Tofty tract flown in FY96 and FY97. Results of geological work done in the Summer of 1996 will be released in the Spring of 1997. Ground-truth geologic mapping in the Rampart-Manley-Tofty districts was planned for completion in two field seasons. In FY97, however, additional geophysical survey tracts were added to the Rampart project. If these new tracts are also geologically surveyed, an additional year of ground-truth work will be needed to finish inventorying the combined tracts. A two-year ground-truth geological survey of the Upper Chulitna mineral district will start in July (FY98) and is scheduled for completion in FY99. Pre-

viously authorized CIP funds are designated to support these geological ground truth activities. Unless additional funds are appropriated to initiate airborne-geophysical/geological mineral surveys elsewhere, no new high mineral potential tracts will be geophysically surveyed in FY98.



For FY98, DGGs has identified four survey tracts that have good potential for the discovery and near-term development of a major mineral deposit. Contingent upon funding available we will initiate an airborne geophysical/geological ground-truth mineral survey on one or more of these four tracts. Cost of the surveys varies depending on each tract's size, location, and bid responses from geophysical services vendors. In the past, geophysical/geological surveys of single minimal but reasonably sized tracts have required about \$400,000 in CIP funds, augmented by Federal Receipts and General Funds from the operating budget.

WHY IS THE PROJECT NEEDED?

Geologic resources comprise a major part of Alaska's economic assets. The location and magnitude of these resources are largely unknown, yet that knowledge is the key to orderly development of the state and to the maintenance of a stable economy. Experienced mineral exploration managers have characterized Alaska's present state of mineral development as analogous to that of the entire group of states west of the Rocky Mountains in the late 1800s. At that time a few major ore bodies had been found and prospectors had located hundreds of prospects but none of the scores of subsequent world-class mines had been discovered. Alaska is

like that. We, however, have the opportunity, capital, and technology to expedite discovery if we so choose.

Alaskans cannot manage or develop assets that are unknown and unquantified. The present lack of geologic knowledge is a formidable impediment to long-range planning for both industry and the state. The lack of knowledge discourages private-sector investment in Alaska, and instead favors capital allocation to other areas of the world where comprehensive assessments exist or are being actively generated. Major mining companies rely on government-supplied exploration

scale (1:63,360) geological, geophysical, and geochemical maps to design and implement their programs. They expect at least this level of effort from any government that seriously desires a mineral industry. Alaska is in competition with every other country, state, and province for investment dollars. Many of those competitors' lands have far less potential than Alaska, are just as remote, have been more explored, or exist in a much less stable political climate than Alaska but they are more successful than Alaska in sustaining a robust mining industry because of their extensive geologic information base or because of the pace at which they are generating such a base of new information.

Applications of a thorough resource information base include:

1. **Enhancing community and local government economies and revenue opportunities.** Resource development in these areas can provide local sources of wages, tax revenue, and royalty income that are necessary for local infrastructure and essential services.

GOVERNOR'S AWARENESS

The Governor has expressed strong support for this program in several forums including speeches before

PROJECT SUPPORT

Local communities, Native corporations, private resource industry, Alaska Minerals Commission, regional borough governments, Department of Commerce and Regional Affairs, Department of Natural Resources.

Following are some of the comments we have received regarding this project.

{{ Even though we are not providing an opinion right now, I wanted to thank you for the opportunity to comment on potential geophysical/geological survey work within the state. The benefit of such surveys has been clearly demonstrated in the Fairbanks district.

2. **Stimulating private-sector exploration and competitive development of Alaska's mineral resources.** The present lack of geologic resource knowledge is a formidable impediment to long-range planning for both industry and the state. The lack of resource knowledge discourages private-sector investment in Alaska, and instead favors capital allocation to other areas of the world where comprehensive assessments exist.
3. **Marine terminal and transportation corridor development.** Transportation infrastructure development always requires cost justification based on prior knowledge of resource availability indicating the likelihood of investment payback and geotechnical knowledge that ensures engineering feasibility.
4. **Long-term decisions on management of state-interest lands.** Products from this project allow the state to look beyond the short-term rise and fall of commodity markets in formulating mineral-resource policies and in responding to related issues, such as land trades, corridor development, area plans, etc.

the Alaska Miners Association and other key business groups.

We support the work of you and your colleagues at DGGs and look forward to the results of additional work. //

—Gary Coulter, Senior Mine Geologist
Cominco Alaska Incorporated

{{ Thank you for the opportunity to comment on areas to be flown by the Survey and for your serious consideration of these requests. Also, compliments to everyone at DNR and DGGs for the excellent products generated by the Geophysics Program. //

—Jeff Foley, Senior Exploration Geologist
Calista Corporation

{{ I would also like to take this opportunity to express our support for the state's airborne geophysical program. We have found the data extremely useful in our exploration effort and feel that the program represents a very efficient, and useful, expenditure of state funds. }}

—James Fueg, Project Geophysicist
Kennecott Exploration Company

{{ I appreciate having this opportunity to suggest areas for your consideration. The airborne program is meeting excellent reception in the minerals industry, and I encourage you to continue your efforts. }}

—Harold J. Noyes
Manager, Resource Development
Doyon, Limited

{{ I and my clients look forward to receiving additional high quality information on Alaska mining districts and I would like to take the opportunity to commend you and your staff for the superb geophysical

and geological products which your efforts have generated in the past. }}

—Curtis J. Freeman, President
Avalon Development Corporation

"Surveys provided by the DGGs program could yield more detailed information about geologic and mineral trends that would be useful for mineral developers. The information about the Yenlo Hills region's potential would also be useful to the Borough as we attempt to encourage the mining industry to locate and expand operations. The Matanuska-Susitna Borough is seeking to diversity the economic opportunities for local residents and exploration of the potential mineral deposits in the Yenlo Hills region would assist in this endeavor."

—Donald L. Moore, Borough Manager
Matanuska-Susitna Borough

PUBLIC BENEFITS

The public at large benefits both in the short and long term through local employment opportunities created in the private sector and better resource management decisions regarding issues such as land trades, classifi-

cations, etc. The public especially benefits from a diversification of Alaska's economy and the enlargement of the state's long-term quality job base.

ALTERNATIVE APPROACHES CONSIDERED

1. Sole reliance on satellite or remote sensing imagery. This approach is rejected because of low resolution and because it cannot look beneath extensive ground cover such as tundra, forest, and soil types in Alaska, and also because it does not provide an unambiguous methodology for detecting subsurface mineralization.
2. Sole reliance on currently available data. Rejected because of general lack and quality of geologic data. Only seven percent of Alaska has adequate geological mapping, and almost none of it has detailed geophysical surveys.
3. Sole reliance on ground-based field investigations. Rejected because of protracted time necessary for such an approach (decades) and because it provides no subsurface information.
4. Sole reliance on airborne geophysical methods. Rejected because geophysical anomalies alone cannot be interpreted without geological and geochemical control.
5. An integrated approach, utilizing regional geophysical and geochemical methods which define resource-rich regions, followed by detailed airborne geophysical surveys and ground-based geological/geochemical investigations of high priority areas. This approach allows the inventory to be completed in an acceptable time, to discriminate between barren and resource-rich anomalies, to identify specific commodities, and provide a quantified estimate of resource value and location.

SUPPORT TO THE OPERATING BUDGET

This project complements the DGGs operating/policy budget. Most of the core geological activities, contract management, and support functions are carried out by existing staff and are partially funded by the base op-

erating budget. Geophysical investigations will be done mainly through private-sector contracts funded by this CIP project.

DESCRIPTION OF WORK TO BE DONE IN FY98

Contingent upon funding in FY98, DGGs proposes to conduct airborne geophysical surveys in one or more areas located in southcentral Alaska, interior Alaska, northwestern Alaska, or western Alaska. During the course of the airborne geophysical/geological mineral inventory project 51 candidate areas have been nominated by Alaskans for mineral surveys. To date, the

highest mineral potential tracts within nine of these nominated mining districts have been subjected to airborne geophysical surveys.

Following is a more detailed description of the work being considered for FY98.

Area 1: Iron Creek, Talkeetna Mountains

Although there is no historic mineral production from this region, the area includes the recently discovered Toklat massive sulfide deposit as well as other extensive iron oxide anomalies that may be indicative of economically viable mineralization. There are also known occurrences of copper, gold, and silver of unknown significance. The area has a potential for harboring mineable massive sulfide base metal deposits in upper Paleozoic volcanic rocks as well as gold stockwork veins within younger intrusive and volcanic rocks. Lateral extensions of Jurassic (144-208 million year old) volcanic-arc rocks that host the Johnson River gold deposit southwest of the proposed survey tract may occur in the area. A combination of airborne-geophysical survey and ground-truth geological map-

ping would be effective in catalyzing more detailed exploration in this region.

Located 35 miles east of the Parks Highway and 60 miles north of Wasilla, if new mineral exploration and mine development were successful, the Wasilla-Palmer area would experience a significant expansion of long-term employment opportunities for the local residents.

Products resulting from these surveys would include:

1. 1:63,360-scale aeromagnetic and airborne-electromagnetic maps
2. 1:63,360-scale bedrock and surficial geologic maps
3. 1:63,360-scale mineral occurrence maps
4. Various other geological, geochemical, and geophysical data compilations.

Area 2: Upper Goodpaster, Yukon-Tanana Uplands

Located 38 miles northeast of Delta Junction, Alaska, the Goodpaster district has produced only modest amounts of gold—about 2,350 ounces. However, recent mineral industry exploration has indicated a new and potentially important gold-polymetallic mineralized trend in part of this historic district. Proposed as a

geophysical survey tract, it is entirely within the upper Goodpaster River valley, a northern tributary of the Tanana River that drains the southern Yukon-Tanana uplands. More than 95 percent of the lands in question are owned and managed by the State of Alaska.

The tract is underlain by regionally metamorphosed rocks of the Yukon-Tanana Terrane, a large group of rocks exposed in east-central Alaska and central Yukon, Canada, and by younger intrusive and volcanic rocks. The intrusive rocks are the same age and have chemical compositions very similar to the intrusive rock that hosts the Fort Knox gold deposit in the Fairbanks district. Recently discovered gold-bismuth-arsenic-antimony mineralization is also similar to many mineralized prospects that surround the Fort Knox ore deposit. The similarities to a relatively near-by world-class mining district suggest a good probability of locating a major mineral deposit in the Goodpaster tract.

Because of its proximity to Delta Junction, mineral development in the proposed survey area, if successful, would offer scores of employment opportunities to the local residents.

Products resulting from these surveys would include:

1. 1:63,360-scale aeromagnetic and airborne-electromagnetic maps
2. 1:63,360-scale bedrock and surficial geologic maps
3. 1:63,360-scale mineral occurrence maps
4. Various other geological, geochemical, and geophysical data compilations.

Area 3: Northern Solomon District, Seward Peninsula

In 1993, DGGs conducted airborne-geophysical and ground-truth geological mineral surveys in the western half of the Nome mining district. The entire eastern half of the district also has high mineral potential but has not been geophysically or geologically inventoried. Our long-term objective is to acquire airborne geophysical and ground-truth geological data for the entire eastern Nome mining district. Because funding is often limited, however, we have subdivided the eastern Nome district into four potential survey tracts: northern Solomon, southern Solomon, Bluff, and Council. Contingent on available funding, we propose to geophysically survey the northern Solomon district in FY98, and commence ground-truth geological mapping of that tract in FY99.

The eastern Nome district encompasses the smaller Solomon, Bluff, and Council districts which have collectively produced 5,921,000 ounces of gold (18 percent of total historical Alaskan output) from 1898-1995. The region is drained by Iron Creek, tributary to the Pilgrim and Kuzitrin Rivers. The proposed tracts contain a mixture of Native, state, and federal lands. The eastern Nome district is underlain by metamorphic

rocks of the Nome Group which have been subdivided by DGGs and industry geologists during recent past geological and mineral surveys in the western Nome district. The Nome Group rocks contain several important mineral deposit types including low-sulfide gold quartz veins and zinc-silver-lead-gold massive sulfide deposits. Heavy mineral gold placer deposits have accounted for nearly all the past gold production. A combined airborne geophysical and geological ground-truth survey will allow industry to conduct more efficient detailed mineral exploration in the Nome area. If successful in catalyzing the development of a major year-round mining operation, the Alaska citizens living on the Seward Peninsula will have a significantly expanded opportunity for local employment.

Products resulting from these surveys would include:

1. 1:63,360-scale aeromagnetic and airborne-electromagnetic maps
2. 1:63,360-scale bedrock and surficial geologic maps
3. 1:63,360-scale mineral occurrence maps
4. Various other geological, geochemical, and geophysical data compilations

Area 4: Ruby-Poorman Mining District, western Alaska

The Ruby-Poorman Mining District comprises an elongated tract in western Alaska south of the Yukon River village of Ruby. The area is relatively accessible compared to other Alaskan Bush locales; a good secondary road links the northern portion of the district with the Yukon River at the village of Ruby. From 1908 to 1995, placer mines have recovered 476,751

ounces (14.8 tonnes) of gold worth \$185 million at current prices. Gold quartz veins have been located as streambed float, and an interesting lead-zinc-silver deposit has been explored by trenching at Beaver Creek near Boston Dome. The chief problem facing the modern explorationist is the extensive cover of windblown

loess that blankets the entire region from valley floor to ridgetop.

Airborne geophysics offers a unique tool for the mineral explorationist in this region because the extensive loess cover has greatly hindered the ability to locate viable exploration targets. The significant past production of gold, favorable geology, and road access makes this area attractive to initiate an airborne survey.

Products resulting from these surveys would include:

1. 1:63,360-scale aeromagnetic and airborne-electromagnetic maps
2. 1:63,360-scale mineral occurrence maps
3. Various other geological, geochemical, and geophysical data compilations.

PROJECT COST

The cost of an airborne-geophysical/geological mineral inventory varies with the size of the survey tract, its location, and the charges proposed by participating geophysical contractors. In the past, completion of geophysical/geological surveys of single minimal but reasonably sized tracts has required about \$400,000 in CIP funds augmented by Federal Receipt grants and General Fund base-budget money. Up to 25 percent of the CIP funds are reserved to help pay for the collection of ground-truth geological framework data needed by the private sector and DGGs to interpret the airborne geophysical maps. The ground-truth geological work costs between \$1.50 and \$2.00 per acre or \$240,000 to \$320,000 for an area equivalent to one 1:63,360-scale quadrangle. Pooling of funds from all three sources (CIP, Federal and GF-base) is required to cover this expense.

The distribution of CIP funds for each proposed tract in the FY98 Alaska Airborne Geophysical/Geological Mineral Inventory project would approximate the schedule that follows.

	FY98
Project personnel	\$50.0
Travel (logistical field travel)	2.0
Geophysical contract, geochemical analyses, helicopter, etc.	338.0
Commodities (GIS, office, and field supplies)	10.0
Equipment	0.0
	\$400.0

ECONOMIC DEVELOPMENT

A primary objective of this project is the stimulation of the state's mineral-based economy by delineating the location of mineral zones within the state's most prospective mineral districts. Experience has shown that this information encourages the investment of millions

of dollars in private mineral exploration funds in the short term and leads to long-term job and revenue creation as discovered mineral deposits are brought into production.

PROJECT STAGING

This project proposed for FY98 is staged over the period 1997 through 1999.

INTERNET DOCUMENT INFORMATION FORM

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